

EXHIBIT 7

CONCRETE CONSTRUCTION EQUIPMENT & TOOLS

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TOOLS FOR THE CONCRETE PRO

CHOOSING THE RIGHT SCREED

Screeds are indispensable for flatwork projects; learn how to choose the right one for the job.

By Kenneth A. Hooker

"Screed" is a word that can be used in various ways, both in and outside of the concrete industry. Sometimes it refers to material placed as a thin overlay; at other times, it's a verb that means to strike off concrete to a desired level. It's also the term for a tool used in striking off, and those tools themselves can take amazingly varied form.

At its most basic, a screed can consist of an ordinary 2x4 that's pulled by hand across the surface of fresh concrete to smooth it out before finishing. It's a low-tech solution, and a physically taxing one, but it's also pretty common. Concrete Construction senior editor Joe Nasvik says he doubts there are many flatwork projects that don't have at least some screeding done by hand. Serving the same purpose as a 2x4, but with a little more precision and durability, are straight edges made of aluminum or magnesium.

Screed options diverge considerably from there, and each type has its place. Concrete contractors tend to add different types of screeds to their toolkits as their work requires, rather than replace one type with another. To choose the right equipment, you need to consider the size of the project, the degree of flatness and levelness required for the finished slab, and the properties of the concrete being placed, as well as other factors.

Vibrating handheld screeds

The simplest powered screeding tools are vibrating handheld screeds, produced by a number of manufacturers and marketed under brand names such as Magic Screed, Vibra Strike, and others. These machines consist of a metal screed bar attached to a frame that's made to vibrate by a small motor. The operator controls the motor, and uses handles on the frame to pull the screed backward across the fresh concrete surface to smooth and level it.

The key advantage of these tools is the reduced muscle power they require. A finisher can work standing up, and the vibration motor helps smooth the concrete. They may be all you need to use on smaller projects, such as residential driveways and patios; on larger jobs, they often are used to supplement larger equipment in areas where space or access is limited.

Screed bars are easy to attach, remove, and replace, and they come in lengths up to 16 feet. In practice, though, screeds longer than 10 or 12 feet are too heavy and awkward to use comfortably. Prices vary, but vibrating handheld screeds are available online from about \$1500 to \$2000, depending on the bar length.



Bunyan Industries

Heavy-duty roller screeds, such as the Bunyan Striker, both distribute and smooth concrete. They are particularly well suited for low-slump and pervious concrete applications.

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Allen Engineering

Vibrating handheld screeds, the lightest and least expensive mechanized screeds, save effort and allow the finisher to work standing up.

Vibrating handheld screeds work best on concrete with 5-inch or higher slump and on jobs that don't require extreme flatness. Fred Murphy, of Buffalo, N.Y.-based Murphy Brothers, says his company uses Magic Screeds for small jobs, but that "the result is only as good as the rakers on the job. The vibrating screeds smooth out the surface, but they don't actually move the material."

Truss screeds

Vibrating truss screeds further automate the screeding process for slabs on ground, pavements, and bridge decks. In these systems, sections of steel truss or A-framing span across and ride along edge forms or screed rails. Screed bars or tubes attached to the truss bottom rails contact and smooth the concrete surface, using vibration produced by gasoline engines or air-driven piston vibrators.

The trusses come in sections, ranging from about 2 to 10 feet long, which interlock to span the required distance up to a maximum of about 60 to 75 feet, depending on the particular machine. The truss sections can be set at an angle to produce crowned or invert profiles.

Either hand-operated or hydraulic winches typically serve to propel the truss screed along the edge forms and across the surface. Hydraulic-powered truss screeds can move at variable speeds, some up to 24 feet per minute.

The obvious benefit of truss screeds is their ability to screed much larger areas in a single pass. Prices vary among models, with truss sections of different lengths usually sold individually and different drive units available as options. One online retailer offers a standard-duty system (suitable for up to 40-foot lengths) from about \$4000 to \$11,000, and a heavy-duty system (up to 70-foot lengths) ranging from about \$4800 to \$19,000.

Roller screeds

Rolling tube screeds have been used in a number of different versions for low-slump concrete applications. In this system, a hollow steel tube up to 27 feet long is drawn manually over the slab, supported at the ends by edge forms or screed rails. A hydraulic pump drives the tube to rotate in the opposite direction from its progress over the slab. This counter-rotation allows the tube to actually cut grade. The spinning tube strikes against the aggregate, causing it to peel forward and bring excess concrete into the tube's path. A final screed pass cuts a small roll of material over the surface to the final elevation.

Designed for low-slump mixes, roller screeds are popular with paving contractors for placing irregular shapes, approaches, ramps, and steep slopes.

Set up in slope configuration, they can meet high surface tolerance standards for inclined flatwork for channels, spillways, ski jumps, and the like. In slope mode, the roller screed typically is drawn up the incline with power winches in a three-pass process. The first is a placement pass, with the rotating tube carrying high material forward into its path. The second is a screeding pass, as previously described. The third pass is made with no rotation, using the tube as a float to dress the surface before the inclined slab is stable enough to allow for finish tooling.



Larger and heavier roller screeds, such as the Bunyan Striker, are particularly well suited to pervious concrete placements. Inventor David Mitchell has taken part in research involving pervious mixtures with low water-cement ratios, little or no fine aggregate, and up to 20% open space in the concrete matrix. Roller screeds accomplish both strike off and compression steps quickly, important given the accelerated drying (and need for quick curing) associated with pervious mixes.

A typical large roller screed system sells for about \$6500, or about \$8000 with optional tools for pervious pavements. Roller tubes tend to wear at the ends and can be shortened and reused to extend their



Multipiquip

Truss screeds that ride on edge forms or screed rails often are used in paving applications.



Somero Enterprises

The Somero SXP-D Laser Screed can spread and screed 240 square feet of concrete to a precise elevation in a single pass.

service life. Hydraulic power to drive the roller can be supplied by a separate pump or provided by a skidsteer or similar source.

Laser screeds

At the opposite end of the screed spectrum from the basic 2x4 stand the laser screeds patented and produced by Somero Enterprises Inc. Since its introduction in the late 1980s, the laser screed has set new standards for accuracy and productivity. As the name suggests, these screeds use lasers to identify and place concrete automatically to specified elevations. The original laser screed, like its current top-of-the-line counterpart SXP-D model, was a large and expensive machine whose cost was justified for contractors doing large projects with stringent flatness or levelness requirements. In the years since, Somero has introduced a range of machines that offer many of the benefits of laser-controlled screeding to contractors who are involved in smaller projects as well.



Somero Enterprises

The Copperhead is a laser-controlled walk-behind screed with a 10-ft.-wide head.

Like the roller screeds described, laser screeds combine both placement and strike off in a single step. The screed heads incorporate three parts: plow, auger, and vibrator, which enable them to spread fresh concrete and set it precisely in a single pass.

Ron Pattison heads Western Enterprises, Rochester, N.Y., a flatwork contractor that specializes in big box retail and other large projects and uses both the SXP and Somero's walk-behind Copperhead machine. Pattison says, "The equipment lets us work faster, flatter, and with fewer people, because we don't need rakers. With the big machine, an operator can spread and screed 240 square feet in a single pass, which takes about 60 seconds. We use the SXP wherever possible, and use the Copperhead and Magic Screeds to screed areas the SXP can't access. The big machine weighs 15,000 pounds, and that load is concentrated on the front stabilizers, so we sometimes can't use it on upper decks or on some heavily reinforced slabs."

Murphy says Murphy Brothers purchased its first laser screed in the late 1980s, and has since acquired Somero's Copperhead, Power Rake, and Mini Screed machines. "That first laser screed paid for itself in the first year, and all of the laser screed equipment has really helped our company to grow. The key benefits are quality and productivity. With the laser screeds, we can do an acre of flatwork a day. Without them, crews can't work with that much stamina or accuracy."

The SXP-D Laser Screed lists for \$350,000. The Copperhead, a walk-behind unit with a 10-foot-wide screed head, is \$60,000. The SMP is a hydraulic powered, ride-on machine that grades, plows, and screeds. It features an 8-foot-wide head and also lists for \$60,000. Somero's Mini Screeds are designed to provide laser-controlled accuracy for residential and small commercial projects. They list for \$30,000. Used and refurbished laser screeds are often available through Somero, and offer a lower-cost alternative.

Options for any job

With such a broad range of screeding equipment available, nobody should have to rely on a 2x4 alone. Consider the type of work you do (or want to do), and you should be able to find an alternative to meet your needs.

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